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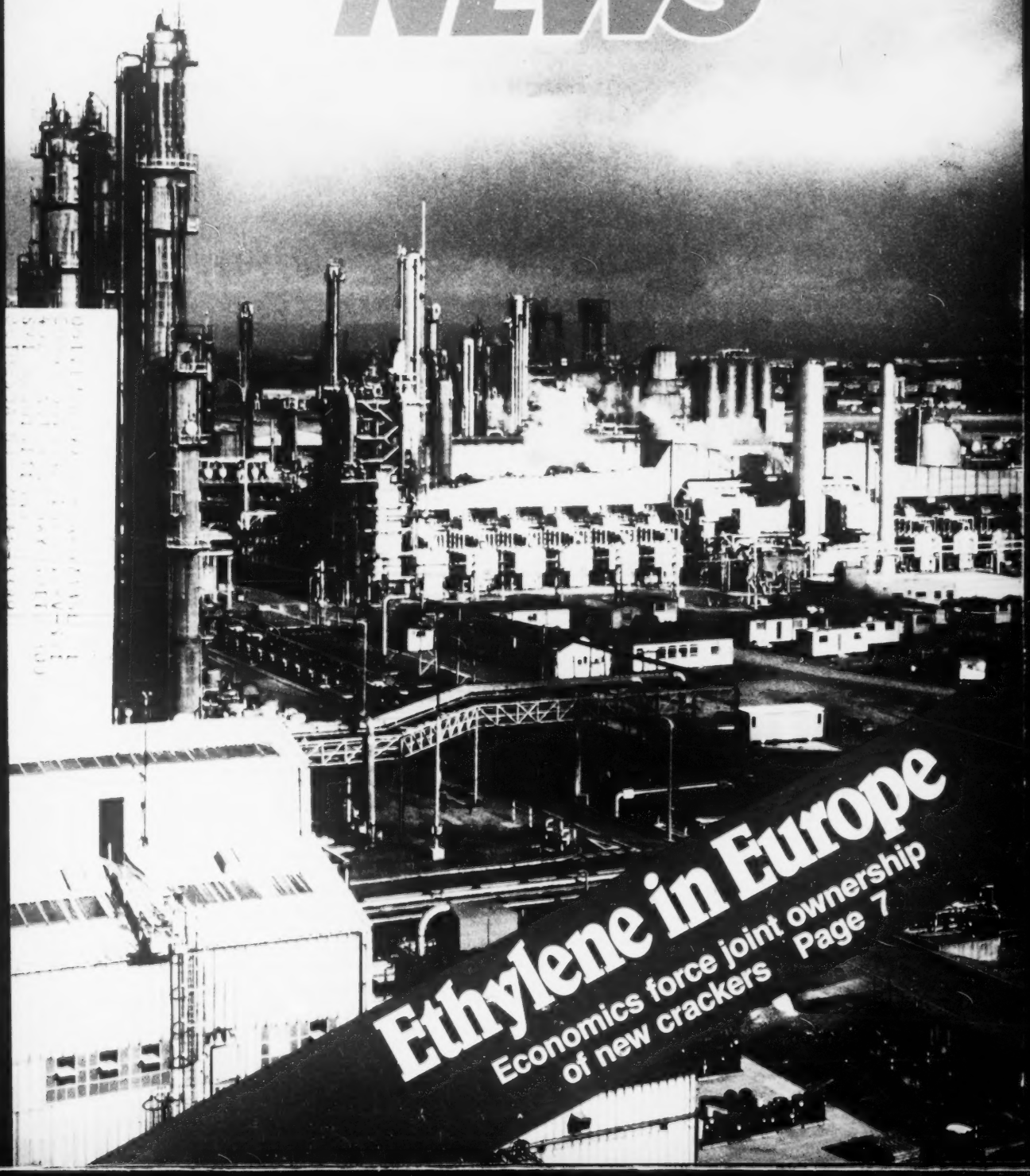
NEWS



Ethylene in Europe

Economics force joint ownership of new crackers
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CHEMICAL & ENGINEERING NEWS

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AUGUST 14, 1989

News of the Week

■ **Japan's Teikyo University merges with West Virginia's Salem College to form Salem-Teikyo University.** Page 4

■ **Chemical firms expand production in some sectors in response to effort to maintain market share.** Page 5

■ **Virtual phaseout of CFC use and production by 2000 is possible says United Nations Environment Program review panel, but may prove expensive.** Page 5

■ **Advisory panel to Utah state legislature votes to release $4.5 million for cold fusion research institute.** Page 5

■ **EPA, in report of indoor air pollution problem, only recommends more research and consumer information.** Page 6

■ **China to construct seven new fertilizer plants despite political and economic turmoil.** Page 6

Business

Chemical earnings show only 3% overall growth for the second quarter; of all chemical-producing companies, pharmaceutical firms looked best racking up an 8% gain. **Page 14**

Extended Product Life, a Pennsylvania-based firm, looks to profit from Food & Drug Administration's ban on sulfites with its development of a nonsulfite-containing product that preserves fruits, vegetables. **Page 19**

Government

Congress active in setting 1990 budgets for various federal agencies, before August recess; committees address a range of environmental problems, other matters. **Page 22**

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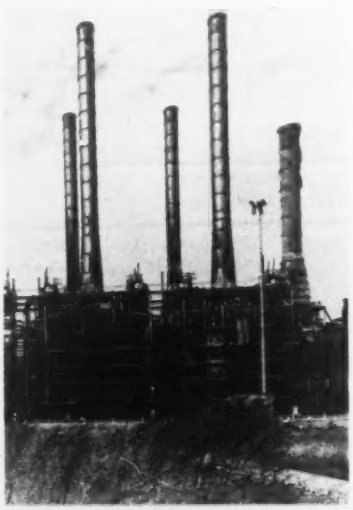
Alternative fuels to petroleum are gaining increased attention, with oxygenates emerging as most promising candidate, Fischer-Tropsch process gaining new prominence. **Page 25**



Cover: BP Chemicals' ethylene cracker at Grangemouth, Scotland

News Focus

Economics are changing the way the European chemical industry approaches its ethylene strategy, forcing joint ownership of the costly new crackers needed to alleviate current tight market. Page 7

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LETTERS

Remembering George Pimentel

SIR: Rebecca Rawls' portrayal of George Pimentel from impressions by his friends and associates (C&EN, July 10, page 27) touched all bases. I think Pimentel, in his winsome manner, would have enjoyed the account.

I spent some five years, during the 1960s, as his editor for the CHEM Study text materials. He was a taskmaster who was tough but always fair and honest. As a high school teacher, I thought I'd be awed by his presence. But his warmth and understanding allayed all my fears. He made me feel that my contributions were real and important.

It is ironic that Art Campbell passed away just a few weeks before Pimentel. These were two giants on whose shoulders the CHEM Study structure rests. No small wonder that the influence of this curriculum study was felt throughout the high schools of the world as well as in the grade schools and colleges. And all because of Pimentel's dogged determination, supported by Campbell and many others, that chemistry is indeed an experimental science and should thus be taught.

Pimentel would remind me that it is not what you know that is important. Rather, it is what you do with what you know that measures your worth. I will never forget him.

Saul L. Geffner
Southbury, Conn.

Epidemiological malpractices?

SIR: Irwin D. Bross alleges (C&EN, April 17, page 3) that the concept or theory that "a little radiation is good for you" is a "crackpot theory." He states, regarding my letter "Radiation epidemiology, extrapolation, and opinion" (C&EN, Jan. 23, page 2), that "not one of the listed references is from a recognized epidemiological journal." I commented earlier on the problems in "Scientific malpractice in epidemiology" (C&EN, April 9, 1984, page 76).

In a commentary on scientific malpractice in epidemiology [*CHEMTECH*, **19**, 269 (1989)], I noted that "when public policy is influenced or determined by statistical and other scientific malpractices, the risk of hazard to public health can be increased." The editors of *CHEMTECH* added a comment by Alvan R. Feinstein relating to epidemiology: "If war is too important to be left to military leaders, and medicine to physicians, the interpretation of epidemiologic results cannot be relegated exclusively to epidemiologists. The people who struggle to understand those results can be helped by recalling that statistics are like a bikini bathing suit: what is revealed is interesting; what is concealed is crucial" [*Science*, **242**, 1263 (1988)].

Also noted in the *CHEMTECH* article are surprising omissions in the 1988 National Academy of Sciences report, "Health Risks of Radon and Other Internally Deposited Alpha-Emitters," also known as the BEIR-IV report. For example, BEIR-IV evidently does not recognize, or is unaware of, the biophysical phenomenon of hormesis. Hormesis is "beneficial stimulation by low levels of nonnutrient agents that are toxic or lethal at very high exposure levels" [*New Engl. J. Med.*, **307**, 1449 (1982)]. BEIR-IV also "overlooks" all publications by T. D. Luckey on radiation hormesis [for example, *Health Phys.* **43**, 771 (1982)], and comparable publications by others. It is doubtful that all of these publications could have been inadvertantly overlooked. Was selective referencing employed?

Regarding inference of causality from correlation (favored by Bross?), R. Doll and A. B. Hill commented [*Brit. Med. J.*, **2**, 1271 (1952)] that "in the U.S.A., the death rate attributed to lung cancer in the different states is positively correlated with the numbers of physicians per 1000 inhabitants." The association was said to be "true independently of the correlation with cigarette consumption—which is also related to the number of physicians per 1000 inhabitants." Would Bross conclude from such data that physicians cause both cigarette smoking and lung cancer because of the correlations?

Regarding smoking and health, P. R. J. Burch [*Lancet*, **1**, 866 (1985)] analyzed combined epidemiological data of three studies that employed randomized sampling and smoking intervention. Control populations were compared with comparable populations that were urged by physicians to reduce or stop smoking. Burch concluded that it is "difficult to evade the implication of the methodologically reputable randomized trials; active cigarette smoking has little or no net carcinogenic action." For example, the Multiple Risk Factor Research Group reported the results of comparisons of mortality rates for randomized populations [*J. Am. Med. Assoc.*, **248**, 1465 (1982)]. Cancer mortality rates were found to be higher in the randomized population that was urged to reduce or stop smoking than in the control

Joint Ventures Likely Basis of European Ethylene Expansion

Substantial additions are being planned to overcome current tight market, but economic factors, including high cost of new crackers, are forcing joint ownership

Patricia L. Layman, C&EN London

Economics, including the initial cost of construction as well as the need to avoid overcapacity, are changing the way the European chemical industry approaches its ethylene strategy.

The most recent new ethylene cracker built in Western Europe, the Fife ethylene plant commissioned in 1985 in Mossmorran, Scotland, is a joint venture of Exxon Chemical and Shell Chemical. The only new cracker currently under construction in Western Europe is Finaneste's in Antwerp, Belgium—a joint venture between Petrofina of Belgium and Neste of Finland. But now, nearly a dozen other companies have proposed building or significantly expanding crackers, which could raise ethylene capacity in Western Europe from 14.5 million metric tons per year to nearly 19 million metric tons.

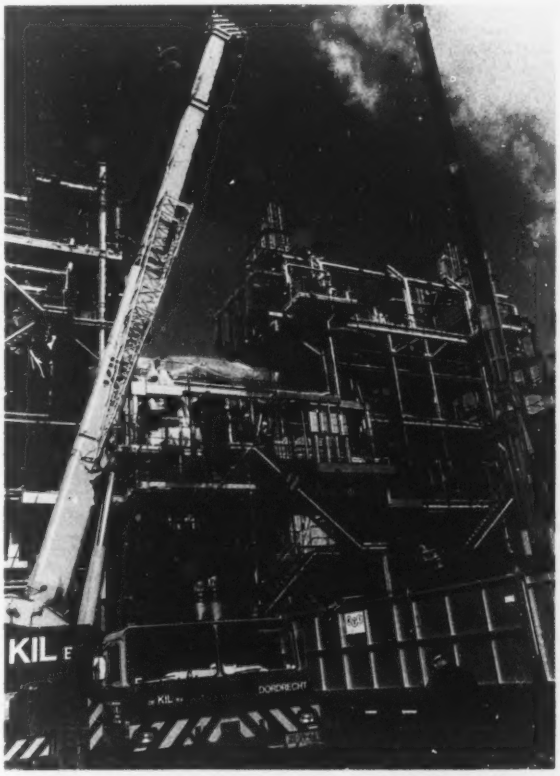
Although there is general agreement that the industry is running flat out and some more capacity is needed, on the face of it, that massive an increase is an appalling scenario. Only in the past two years has ethylene resumed a healthy balance sheet, following a glut of overcapacity in the early 1980s.

However, at least two of the producers who have announced possible crackers on the continent are actively seeking joint-venture partners, and others are seriously weighing this route.

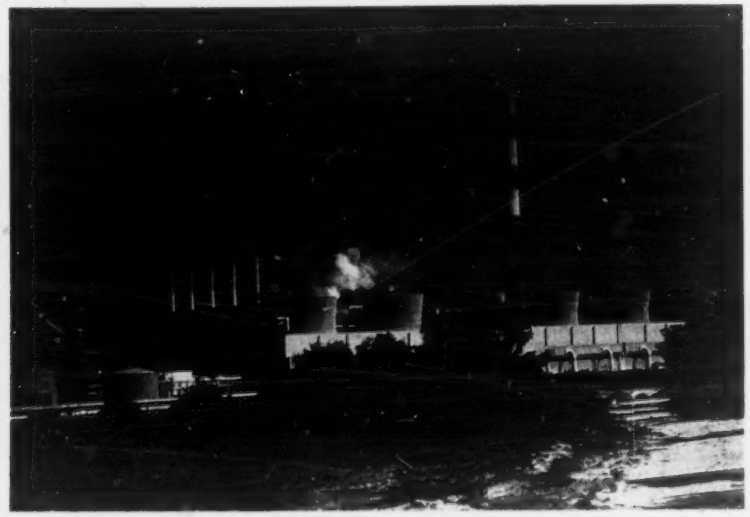
As a result, the phrase being used in the European industry more and more commonly is "industry cracker." Joint ventures, such as the Fife plant and Finaneste's cracker, seem likely to shape the future of the ethylene industry in Western Europe in the coming decade, as opposed to the U.S., where the concept of joint ventures has not yet progressed beyond the talk stage.

The pressures for joint-venture investment are becoming particularly persuasive. At least three factors are involved:

- The sheer cost of construction of a new cracker—at about $1000 per metric ton of capacity, works out to about $700 million for a 700,000 metric-ton-per-year ethylene cracker, the current upper level of "world scale."
- The recognized need for continuing consolidation within the industry in Western Europe. Capacity



DSM revamps ethylene furnaces at Netherlands plant



Shell's petrochemicals complex at Berre, France

itself has been slashed, from more than 18 million metric tons in 1980, to about 14.5 million now. However, the number of producers remains high. According to the Association of Petrochemicals Producers in Europe (APPE), one of the major sector groups within the European Chemical Industry Federation (CEFIC), there are 25 ethylene producers in Western Europe, compared with 21 in the U.S. and 11 in Japan. Moreover, Europe has a larger number of smaller operators than other major trading blocs; in the European market, the six largest producers account for 45% of production, compared with 55% in the U.S. and 50% in Japan.

• The fear of a resurgence of overcapacity from huge lumps of capacity coming onstream at the same time, swamping the market. In the Western European industry, which had serious problems of capacity underutilization and losses on ethylene in the first part of this decade, this fear is very much alive among senior managers, in particular, who had to make the subsequent painful decisions to cut or close cracker capacity.

In a way, closures of ethylene crackers in Western Europe have been made even more difficult because there are few isolated merchant crackers in Europe. Most crackers are part of integrated company petrochemical complexes, or are closely linked by pipeline to customers on long-term contract. And pipeline facilities are limited in Europe, where there are three distinct pipelines: one in the U.K., one in southern France, and the third in Benelux-West Germany.

The pipelines, which are open to all, are under capacity pressures just as constant as cracker capacity. The major pipeline in Benelux-West Germany, for example, operated by ARG (Aethylen Rohrleitungs Gesellschaft), jointly owned by the user partners, will be expanded by the beginning of next year. ARG is building a second ethylene pipeline to run alongside the existing line, increasing its grid length 18%, to cope with expansions planned by ethylene consumers in Belgium.

The most significant expansion of the three, in recent years, is in the U.K. Shell has sought permission from the British government to build a new pipeline from Grangemouth, Scotland, to its plants near Liverpool, England, in what would be a $150 million project scheduled for completion in early 1992. It would more than double ethylene carrying capacity from the ethane crackers in Scotland to derivatives plants in England's northwest. A new pipeline is especially needed, according to Shell, because demand is expected to exceed capacity of the existing pipeline by the early 1990s. Expansions in crackers along the route of the current pipeline will also add to the pressure.

The expansions that have been announced for the U.K. are just part of a spreading pattern of announcements throughout Western Europe. Companies are announcing new crackers, or major expansions of existing ones, as well as continuing to add incremental bits of capacity, through process improvements. At the same time, the management at various companies insist that the industry has learned its lesson, that it is not embarking on a round of overbuilding.

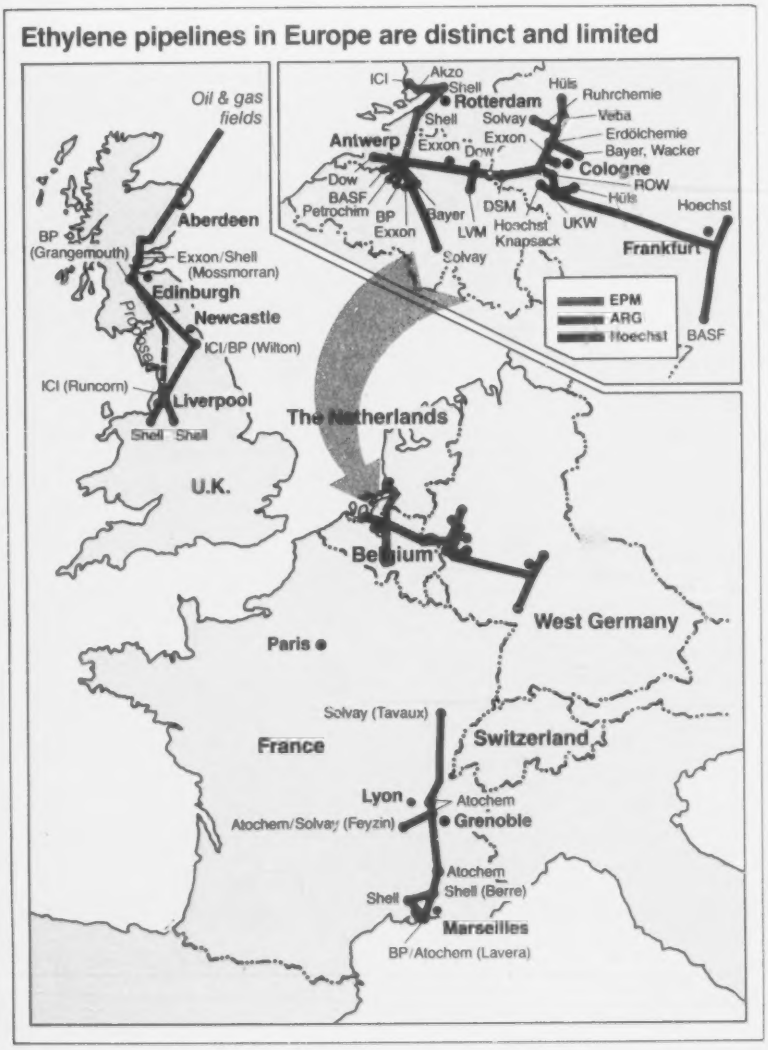
Some industry observers, however, have found worrisome signs in the host of announcements that have followed in the wake of crackers being run nearly flat out for the past year and a half. These observers fear that the Western European chemical industry will tumble headlong, once again, into the gloomy days of glut and loss.

"Average operating rates are at or close to a peak," noted David S. Glass, a director of Chem Systems International, at a petrochemicals conference in London in May. That can pose a potential problem. "Operating rates of over 90% are difficult to sustain for long periods due to maintenance closures, and the increasing likelihood of unplanned outages as plants are tested to the limit of their design capacity."

Chem Systems' work, he said, indicates that the margin for ethylene follows a relationship with operating rate that is more or less linear, up to about 90% capacity utilization—it then takes off exponentially. With the industry in that exponential region in the past two years, cracker operation contributed sound profits to the balance sheet.

Consequently, according to Glass, with the resultant cash generation from well-used plants, and plants at capacity, "the natural reaction is to spend on reinvestment."

Rising investment returns, in turn, have spurred interest in building new crackers from Enimont at Brindisi, Italy; Veba at Gelsenkirchen, West Germany;



Repsol at Cartagena, Spain; Dow at Terneuzen, the Netherlands; Shell at Moerdijk, the Netherlands; and BASF at Antwerp, Belgium.

Moreover, Erdölchemie is restarting its second Dormagen cracker, ICI is considering the restart of its Wilton (U.K.) 5 cracker, and BP Chemicals has announced the doubling of capacity of its Grangemouth cracker. All of this adds up to more than 4 million metric tons of new capacity, disregarding expansions of existing units, according to Glass.

"It is clear that not all of these plans will see the light of day before 1995, if at all," he said. "But the trend is such as to take overall ethylene capacity from 15 million metric tons in 1989 to at least 19 million by 1995, possibly considerably more."

Already, some of the announcements are becoming less firm as market conditions soften. Although the slowdowns in demand and falling prices probably don't warrant the "free-fall" labels gloomily ladled out by some industry observers, they are distinct, nonetheless.

Neville B. Pinnington, vice president of Shell Chemicals International Trading Co. with responsibility for bulk petrochemicals, notes that "some of the products desperately tight have begun to turn," although, he adds, some perhaps have bottomed out and are starting back up again. "Demand is higher than it was a year ago, but not increasing as fast as it did a year ago."

The drop in demand has led to a fall in prices for ethylene derivatives, such as polyethylene. For instance, the price of low-density polyethylene rose in the course of about two years from less than $600 per metric ton to more than $1200, but in the past six months, particularly at the end of the second quarter, has fallen off significantly. Indeed, according to one source, the spot price for LDPE toward the end of July was in the range of $780 to $850 per ton. However, prices have started to pick up again.

At the same time, the price of naphtha, the primary cracker feedstock in Western Europe, has begun going up. From well below $150 per metric ton for most of 1988, it moved up to about $170 per ton during the second quarter. And although prices slipped slightly in July, as demand went into a summer slack, they still are moving upward, following oil prices. A rise in feedstock prices and a decline in the prices for derivatives has begun to squeeze margins on ethylene, bringing a more realistic pattern into new-cracker thinking.

Most forecasters expect the demand for ethylene to grow at just over the growth rate of gross national product, perhaps at 2 to 3% a year. But even at a lower rate—a conservative 1.5%, say—an extra 225,000 metric tons will be needed each year. That, in turn, would be the equivalent of a major new cracker every two or three years, a capacity contribution that probably cannot be met even by industrywide process improvements and incremental expansions.

The uncertainty comes in how that capacity will be added, and who will add it. Most industry observers agree that, this time around, the announcements are in response to pressures within the company, from middle-level marketing managers who see a strategic need for companies to be self-sufficient.

That is different from the late 1970s and early 1980s,

when there was a decided "virility factor" of top executives having to have their own crackers, according to one analyst. It's not a question now of keeping up with the Joneses, although, says Shell's Pinnington, "If you are in a leading position, you don't want to give that up. If you get in amongst the leaders, that will discourage others. Therefore, there is an element of a race to this."

Most of the proposals have cited corporate need for the additions. For example, when BP Chemicals announced it was considering doubling the capacity at its Grangemouth cracker late last year, John Turnbull, chief executive for petrochemicals and polymers, pointed out that BP was already a net purchaser of ethylene. By 1992, the company predicted, its deficit would be 250,000 metric tons, and it could not accept that.

All the announcements thus far have made sense for each individual corporation, agrees Michael C. Cockburn, secretary general of APPE, but he is worried about overcapacity in the region. "I hear those denials, that companies say they have learned their lesson. But they haven't. The industry is staffed with people who are volume-hungry, brought up in the days when volume was king."

That was acceptable, he believes, when Western Europe was a major trading block. But that situation is changing rapidly. Ethylene itself may not be widely traded globally, but its derivatives are. Western Europe has long been one of the major derivatives-exporting countries, with product going in particular to the Far East and Eastern Europe. But countries there, eager to cut import bills, are starting to build up their own petrochemical industries.

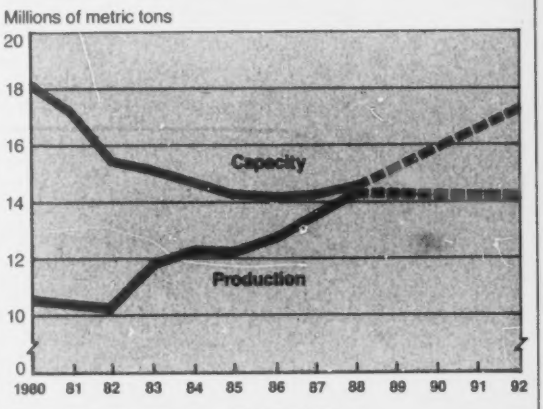
The impact of Third World building has long been a concern, for example, of Stuart Wamsley, formerly senior chemicals analyst with Morgan Stanley International, and now a consultant and editor of a chemicals newsletter, *Focus on Chemicals*. According to Wamsley, the view that overcapacity will not happen—that growth rates remain too strong, and the Western World is building responsibly this time round—is too narrow and insular. In particular, he says, that view fails to take account of the huge capacities now emerging in developing nations.

According to figures he compiled for Morgan Stanley, areas of the world outside the U.S., Western Europe, and Japan have already built 9.5 million metric tons per year of ethylene capacity—two thirds that of Western Europe, and more than half that of the U.S. Planned additions between now and 1992 will add another 9.4 million metric tons, all to feed local derivatives plants. Other possible additions that have been reported could add yet another 21 million metric tons of capacity; current world capacity is 56 million metric tons. Local market supply—which could also serve export markets—will, in turn, cut into the market for Western European exports, hastening the decline in the continent's net trade of ethylene derivatives.

Some analysts believe that the industry also could avoid overcapacity by scrapping old cracker capacity as it builds new. Although crackers are continually being updated, says APPE's Cockburn, "there is a certain dating factor—you can see physically the difference in the building, for example, between a cracker of today compared with one from 1970. There are many more improvements you can bring in, rather than just debottlenecking."

However it controls ethylene capacity, the industry

Ethylene capacity use is high



Source: Association of Petrochemicals Producers in Europe

Shell, Enimont are Europe's biggest ethylene producers

Thousands of metric tons	Capacity	Additions 1988–92	Other additions possible
Atochem	610[a]	100[a]	
BASF/ROW[b]	775		600
BP Chemicals	750[c]	290	
Dow	1,315	160	
DSM	925	100	
Enimont	1,455	560	50
Erdolchemie[d]	500	260	20
Exxon	665[e]	105[e]	15[e]
Finaneste[f]	550	450	
Huels/Veba	650	55	480
ICI	620[g]		
Naphtachimie[h]	500		50
Neste	530[i]		
Norsty[j]	390	30	
OeMV	580		
Orkem	695		220
Repsol	595	115	
Shell/ROW[b]	1,475[e]	285[e]	135[e]
Statoil	350	70	
URBK	440	25	35
Others	225		100
TOTAL	14,595	2605	1705

a Includes 42.5% Solvay share in cracker, Feyzin, France. b 50-50 joint venture; ROW = Rheinische Olefinwerke. c Includes 20% share in ICI cracker, Wilton, U.K. d 50-50 joint venture, Bayer and BP Chemicals. e Includes 50% of Fife ethylene plant, Mossmorran, Scotland. f 65-35 joint venture, Petrofina and Neste. g 80% share of Wilton cracker. h 50-50 joint venture, Atochem and BP Chemicals. I Includes cracker at Sines, leased from Portuguese government. j 51-49 joint venture, Norsk Hydro and Statoil. **Sources:** Morgan Stanley International, company reports

in Western Europe must wrestle with one other factor: the number of producers. Notes Cockburn, the number "has come down, but there is still more to do—there are too many. A number of producers of ethylene in Europe are uneconomic."

One of the major difficulties with consolidations is that there are few isolated merchant crackers in the continent. Most are part of an integrated petrochemicals and polymers complex. Deintegrating a cracker from a complex would be extremely difficult, although it can be done through asset swaps, for example, as has just happened with Enimont of Italy and Orkem of France at Orkem's Dunkirk cracker and petrochemicals complex.

There is also the question of obtaining approval of consolidation or rationalization from the regulatory authorities in the European Community. The specific trade authorities are in D-G IV, one of 20 directorates general making up the European Commission. D-G IV is charged with competition policy, with part of its charter akin to U.S. government antitrust units.

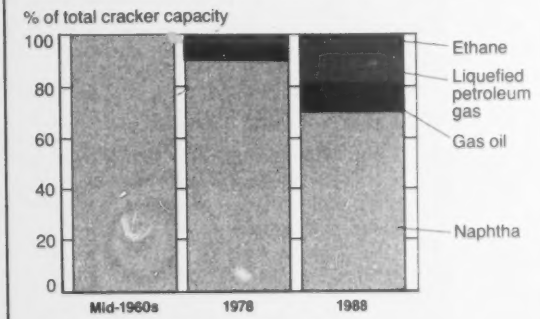
Thus far, there has been slow but steady success by the industry in obtaining clearance for its swaps or joint ventures. But the industry is keeping a close eye on the new direction D-G IV appears to be taking: At a petrochemicals conference in London last month, a representative of D-G IV said, in effect, that it had been generous with the chemical industry, but that this would not necessarily continue.

Says Jack G. Helfenstein, Dow Europe's executive vice president for hydrocarbons and materials management, "What we see happening is the industry cracker, owned or operated with a commitment from more than one company. We are exploring that for the Terneuzen expansion.

"The EC rules allow manufacturing joint ventures. You cannot have, without dispensation, a marketing joint venture. However, providing there is no coordination of ambitions and activities in marketing, and no constraints, you can combine to manufacture."

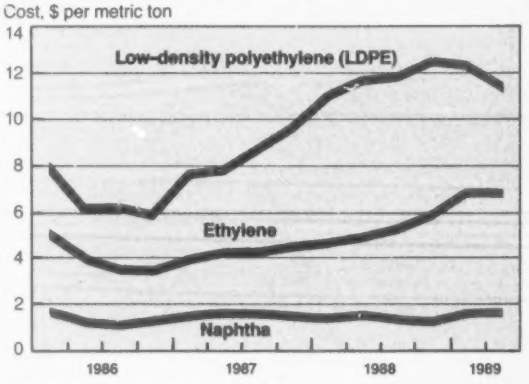
With such a venture, he adds, there would be "nothing to stop companies, then, to get economies of scale,

Naphtha continues to dominate cracker feedstocks, but its share is smaller



Source: Association of Petrochemicals Producers in Europe

Naphtha price up, LDPE's down, squeezing ethylene margins



Source: Averages taken from published reports

new technology, whatever, through joint ventures in Europe. But the EC has to be assured that the cooperation is not beyond that. The chances are that one company will be the manufacturer, with two or three associated with the venture, in securing the off-take. There are various ways you can absolutely commit," without committing capital budgets, he says. "I think there will be that."

The idea of an "industry cracker" is also one that Shell's Pinnington would agree with. Such a venture, he says, would be a sensible way of spreading investment risk, and avoiding market disruption from several batches of capacity coming on stream at once.

"The thing that worries us is that people have become used to derivatives plants being fully loaded," he says. "So if someone says, 'I'm going to build a 200,000 metric-ton-per-year polyethylene plant, therefore I want a 200,000-metric-ton cracker,' he's forgetting that it doesn't happen from 'year one'. Those plants normally take some years to build up; there is some danger of overestimating the growth of the derivatives."

There is no question, he adds, that the EC and D-G IV "are taking a very close look at the chemical industry. They want to put as many teeth in their competition policy as they can. They undoubtedly would look very closely if the industry would come up with a set of joint ventures in ethylene; we would have to answer a lot of questions."

However, for purely manufacturing joint ventures, in which each company determines its own product slate and makes its own third-party contracts, although the companies would have to justify the venture, there is precedent—the Mossmorran plant, for example, operated by Exxon, but with Shell taking 50% of the output.

Joint ventures, coupled with the hard reflection that falling margins bring, may just carry Western Europe into the 1990s without a great sweep of overcapacity. □

Chemical Earnings Up Only Slightly in Second Quarter

William J. Storck,
C&EN Northeast News Bureau

The U.S. chemical earnings boom has turned into a pop. After years of running up phenomenal double-digit earnings growth in each successive quarter, U.S. chemical companies managed only 3% growth in this year's second quarter, compared with a year earlier. Small as that growth was, other chemical-producing companies did not fare well during the quarter. As a group, oil companies that also make chemicals posted a 3% decline in earnings, and chemical-producing diversified companies averaged only a slight 1% earnings gain. Only drug companies beat the chemical companies' increase, with an 8% gain.

The 3% growth for the chemical companies is the first time that earnings growth has been out of the double-digit range since the first quarter of 1986 and is the lowest since the fourth quarter of 1985 when the 30 chemical companies regularly surveyed by C&EN showed a decline in quarterly earnings results. At times, earnings growth was nothing short of phenomenal, averaging more than 50% and almost doubling in one quarter.

The gross fundamentals were still good in the second quarter. Chemical production for the quarter, according to government figures, was up about 6% from last year's second quarter. And chemical prices were up about 9%. Both of these measures slowed slightly from previous quarters, but they are still good by most standards.

However, the problems came in some markets and in some internal factors in the industry. Automobiles and construction, two key markets

Chemical industry leaders for the second quarter . . .

Sales

Rank 1989		$ Millions	Rank 1988
1	Dow Chemical	$4601.0	1
2	Monsanto	2348.0	2
3	Union Carbide	2277.0	3
4	W. R. Grace	1510.7	4
5	American Cyanamid	1299.3	5
6	Hercules	791.5	6
7	Rohm & Haas	735.2	7
8	Arco Chemical	726.0	8
9	Quantum Chemical	672.5	9
10	Air Products	663.7	10

Earnings[a]

	$ Millions	Rank 1988
Dow Chemical	$728.0	1
Monsanto	241.0	2
Union Carbide	186.0	3
Arco Chemical	120.0	4
American Cyanamid	110.4	5
Rohm & Haas	69.3	7
Ethyl	57.6	9
Air Products	53.4	11
B. F. Goodrich	53.0	10
Georgia Gulf	49.3	12

Profitability

	Earnings as % of sales	Rank 1988
International Flavors	17.4%	4
Vista Chemical	17.3	7
Georgia Gulf	16.9	3
Arco Chemical	16.5	1
Great Lakes Chemical	16.2	2
Dow Chemical	15.8	5
Loctite	13.3	10
International Minerals	11.3	12
Nalco Chemical	11.1	15
Betz Laboratories	10.8	14

. . . and for the first six months of 1989

Sales

Rank 1989		$ Millions	Rank 1988
1	Dow Chemical	$9086.0	1
2	Monsanto	4613.0	2
3	Union Carbide	4518.0	3
4	W. R. Grace	2907.9	4
5	American Cyanamid	2530.9	5
6	Hercules	1530.9	7
7	Quantum Chemical	1486.6	6
8	Arco Chemical	1425.0	9
9	Rohm & Haas	1414.7	8
10	Air Products	1332.7	10

Earnings[a]

	$ Millions	Rank 1988
Dow Chemical	$1471.0	1
Monsanto	463.0	2
Union Carbide	387.0	3
Arco Chemical	236.0	4
American Cyanamid	199.4	5
Rohm & Haas	122.4	7
Quantum Chemical	117.4	6
Ethyl	114.0	8
Air Products	110.0	9
B. F. Goodrich	105.3	10

Profitability

	Earnings as % of sales	Rank 1988
Great Lakes Chemical	17.7%	2
International Flavors	17.2	5
Georgia Gulf	17.2	3
Vista Chemical	16.9	6
Arco Chemical	16.6	1
Dow Chemical	16.2	7
Loctite	12.7	10
Betz Laboratories	10.7	10
Nalco Chemical	10.6	12
Ethyl	10.4	9

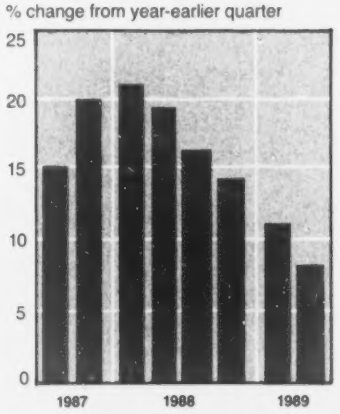
Note: Based on 30 chemical companies listed on page 16. a After taxes.

Chemical industry second-quarter 1989 results

- Sales increased 8%
- Earnings gained 3%
- Profit margins at 10%
- Production rose 6%
- Prices climbed 9%

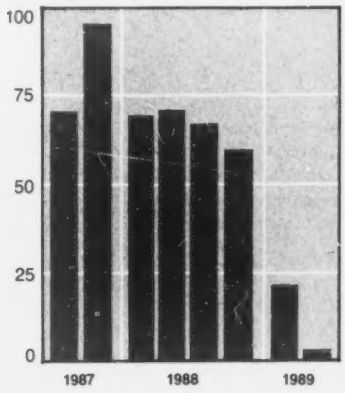
Sales

% change from year-earlier quarter



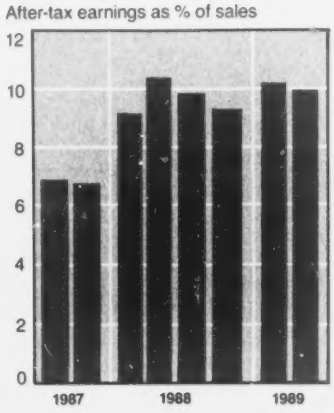
Earnings

% change from year-earlier quarter



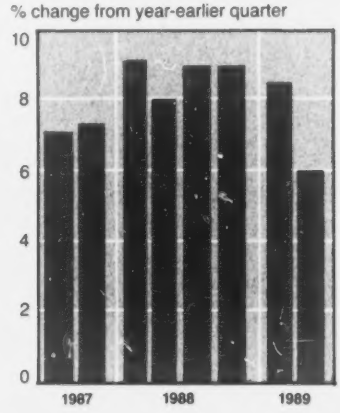
Profit margins

After-tax earnings as % of sales



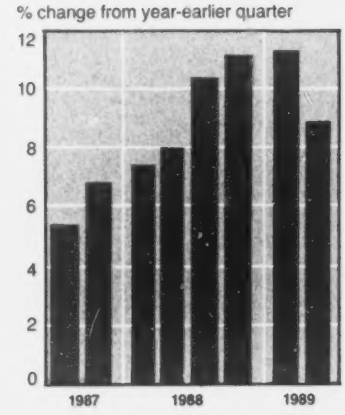
Production

% change from year-earlier quarter



Prices

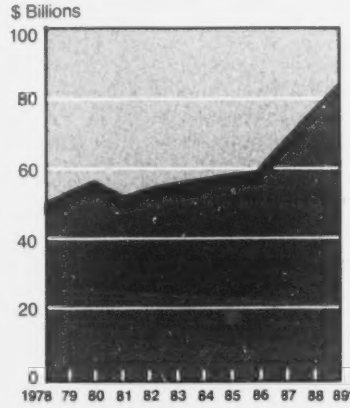
% change from year-earlier quarter



Sales in 1989 will increase about 8%, as earnings also grow about 8%, leaving profit margins at 9.8%

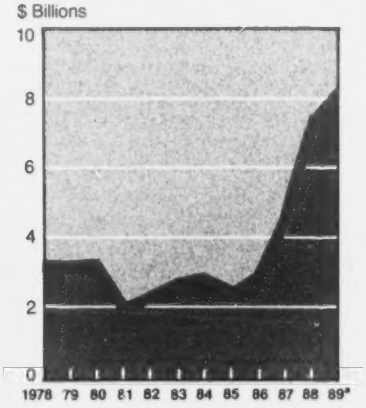
Annual sales

$ Billions



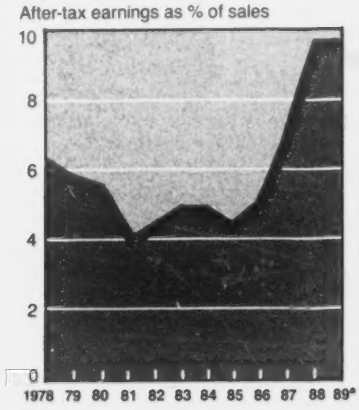
Annual earnings

$ Billions



Annual profit margins

After-tax earnings as % of sales



Note: All sales, earnings, and profit margin data are based on combined results of 30 chemical companies listed on page 16. a C&EN estimates.

Second-quarter earnings declined at a third of leading chemical companies

	SECOND-QUARTER 1989						FIRST-HALF 1989			
	Sales ($ millions)	Earnings[a] ($ millions)	Change from 1988 Sales	Change from 1988 Earnings	Profit margin[b] 1989	Profit margin[b] 1988	Sales ($ millions)	Earnings[a] ($ millions)	Change from 1988 Sales	Change from 1988 Earnings
Air Products[c]	$ 663.7	$ 53.4	10%	2%	8.0%	8.6%	$ 1,332.7	$ 110.0	9%	2%
American Cyanamid[c]	1,299.3	110.4	4	11	8.5	8.0	2,530.9	199.4	6	12
Arco Chemical[c]	726.0	120.0	7	−5	16.5	18.6	1,425.0	236.0	13	1
Aristech	268.2	18.6	0	−47	6.9	13.2	543.4	45.1	3	−49
Betz Laboratories	130.4	14.1	17	17	10.8	10.8	254.8	27.2	17	17
Cabot[c]	470.5	9.6	11	−42	2.0	3.9	1,011.4	38.6	14	10
Chemed	151.1	7.2	40	19	4.8	5.6	293.0	12.6	41	18
Crompton & Knowles	95.0	7.3	39	47	7.7	7.3	182.8	12.7	47	45
Dow Chemical[c]	4,601.0	728.0	8	14	15.8	15.0	9,086.0	1471.0	10	29
Ethyl[c]	555.0	57.6	12	1	10.4	11.5	1.091.0	114.0	12	4
First Mississippi	137.0	−2.6	51	def	def	14.9	255.2	6.0	67	−56
H. B. Fuller	196.3	4.9	14	−14	2.5	3.3	373.9	6.8	14	−35
Georgia Gulf	292.3	49.3	6	4	16.9	17.2	610.0	104.7	22	22
B. F. Goodrich[c]	628.8	53.0	8	−7	8.4	9.7	1,244.7	105.3	12	8
W. R. Grace[c]	1,510.7	44.6	4	−23	3.0	4.0	2,907.9	74.9	6	−13
Great Lakes Chemical	192.3	31.2	40	25	16.2	18.2	337.4	59.8	22	22
Hercules[c]	791.5	41.6	12	−12	5.3	6.7	1,530.9	86.4	12	−1
International Flavors	236.8	41.3	1	6	17.4	16.6	464.0	80.0	1	7
International Minerals	265.9	30.0	1	1	11.3	11.3	524.3	52.4	6	0
Loctite	120.9	16.1	9	25	13.3	11.7	237.3	30.2	8	29
Lubrizol	325.6	26.0	14	17	8.0	7.8	668.8	56.7	16	23
Monsanto[c]	2,348.0	241.0	4	10	10.3	9.7	4,613.0	463.0	5	8
Nalco Chemical	268.1	29.7	8	14	11.1	10.5	517.6	54.8	7	7
Olin[c]	658.0	35.0	14	21	5.3	5.0	1,300.0	69.0	16	19
Petrolite	71.9	2.2	−5	−40	3.1	4.9	144.3	5.3	−6	−37
Quantum Chemical[c]	672.5	46.0	4	−42	6.8	12.2	1,486.6	117.4	7	−33
Rohm & Haas[c]	735.2	69.3	5	−9	9.4	10.8	1,414.7	122.4	7	−11
Union Carbide[c]	2,277.0	186.0	7	−1	8.2	8.8	4,518.0	387.0	11	34
Vista Chemical	202.3	35.1	7	26	17.3	14.7	400.8	67.6	−1	7
Witco[c]	413.4	23.2	2	2	5.6	5.6	813.0	43.5	2	39
Total 15 larger companies	**$18,350.6**	**$1818.6**	**7%**	**3%**	**9.9%**	**10.3%**	**$36,305.7**	**$3637.9**	**9%**	**14%**
Total 15 smaller companies	**$ 2,954.1**	**$ 310.5**	**12%**	**0%**	**10.5%**	**11.8%**	**$ 5,807.5**	**$ 622.0**	**13%**	**2%**
GRAND TOTAL	**$21,304.7**	**$2129.1**	**8%**	**3%**	**10.0%**	**10.5%**	**$42,113.2**	**$4259.9**	**10%**	**12%**

a After-tax earnings from continuing operations, excluding significant nonrecurring and extraordinary items. b After-tax earnings as a percentage of sales. c One of the 15 largest companies.

for the chemical industry, have been slowed by higher interest rates, a problem that may be easing as the Federal Reserve Board loosens credit to sustain the economy in an attempt to avoid a recession.

Maintenance itself has cut into sales and profits in some product areas as companies shut down plants, reducing the amount of product they had to sell. This problem was made worse in some instances by slow deliveries of materials needed for maintenance.

Raw material costs also climbed for some companies, cutting into profits. Firms using ethylene have been hit during recent months as plant outages and maintenance downtimes have cut supply, causing prices to rise. This situation abated somewhat in July boding well for the third quarter.

Also, foreign earnings have suffered at chemical companies. Although exports have generally held up, the currency translation has cut into earnings because of the stronger dollar as compared with other currencies. This has hampered earnings from foreign operations, even though volumes have not suffered.

Although chemical earnings averaged only a 3% rise, individual company performances during the quarter ranged from decline into deficit at ammonia-plagued First Mississippi to an increase of 47% at Crompton & Knowles. Of the 30 companies, 12 posted earnings declines. Of the 18 that showed improvement, four were below the 3% average. However, 12 of the companies still showed double-digit earnings growth in the quarter.

The 3% growth at the 30 chemical companies surveyed lifted earnings to a total of $2.13 billion. Sales during the period rose 8% to $21.3 billion, giving a profit margin of 10.0%. This profitability measure is slightly less than the 10.5% for last year's second quarter.

The difference in performance between the large and small companies was readily apparent in the second quarter. For the 15 larger

FIRST-HALF 1989		12-MONTH RUNNING DATA			
Profit margin[b]		Change from 1988		Profit margin[b]	
1989	1988	Sales	Earnings	1989	1988
8.3%	8.8%	10%	9%	8.5%	8.6%
7.9	7.5	6	11	6.9	6.6
16.6	18.6	26	33	17.3	16.4
8.3	16.6	7	34	12.2	9.7
10.7	10.7	16	19	10.8	10.5
3.8	3.9	17	11	3.5	3.6
4.3	5.1	43	7	3.9	5.2
6.9	7.0	39	44	5.8	5.6
16.2	13.9	16	50	15.6	12.0
10.4	11.3	23	12	10.1	11.1
2.3	8.8	36	−30	3.8	7.4
1.8	3.2	15	−32	2.4	4.0
17.2	17.3	34	42	18.1	17.0
8.5	8.8	8	68	9.0	5.8
2.6	3.1	16	−5	3.0	3.7
17.7	17.7	17	41	18.5	15.4
5.6	6.4	8	−28	4.6	6.9
17.2	16.3	2	9	15.8	14.9
10.0	10.6	−29	−26	8.0	7.7
12.7	10.7	9	30	11.9	10.0
8.5	8.0	14	33	8.5	7.3
10.0	9.8	5	9	7.3	7.1
10.6	10.6	10	18	10.7	10.0
5.3	5.2	18	23	4.4	4.2
3.7	5.5	−4	−37	3.4	5.2
7.9	12.5	6	21	10.8	9.5
8.7	10.4	10	0	8.2	8.9
8.6	7.1	15	113	9.3	5.0
16.9	15.7	6	23	16.7	14.3
5.4	3.9	4	3	5.1	5.1
10.0%	**9.6%**	**11%**	**33%**	**9.5%**	**7.9%**
10.7%	**11.9%**	**20%**	**26%**	**12.3%**	**11.7%**
10.1%	**9.9%**	**12%**	**31%**	**9.9%**	**8.4%**

def = deficit.

firms, earnings rose 3% to $1.82 billion on a 7% sales increase to $18.4 billion. Profit margins for the 15 larger companies averaged 9.9%, a drop from the 10.3% average in second-quarter 1988.

For the 15 smaller companies, earnings remained close to last year's second-quarter level, at $311 million, although sales increased 12% to $2.95 billion. As a result, the average profit margin for this group was 10.5%, down 1.3 percentage points from second-quarter 1988's average profit margin of 11.8%.

For the first half, combined earnings for the 30 companies rose 12% from first-half 1988 to $4.26 billion on a 10% sales gain to $42.1 billion. Profit margins averaged 10.1% up from 9.9% in first-half 1988.

Earnings for the first half for the group of 15 larger companies grew 14% to $3.64 billion on a sales growth of 9% to $36.3 billion. Profit margins for this group increased to 10.0% from 9.6% in first-half 1988. For the 15 smaller companies, earnings increased only 2% to $622 million, but sales increased 13% to $5.81 billion. The average profit margin for this group fell to 10.7% from 11.9% a year earlier.

Second-quarter earnings for the 30 companies were essentially unchanged from the first quarter, but sales were up 2.4%. Earnings were flat for both larger and smaller firms, but the smaller firms beat out the larger ones in sales growth at 3.5%, compared with 2.2%.

While overall earnings for chemical firms were increasing only slightly during the second quarter, chemical earnings rose substantially for oil companies. A group of six oil companies—Chevron, Exxon, Mobil, Occidental, Shell, and Texaco—posted total chemical earnings of $1.16 billion for the quarter, up 23% from the same period last year. Considering that oil companies generally had a poor quarter for earnings, chemical results added considerably to the bottom line. Occidental's chemical earnings include Cain Chemical for only part of the period last year, making the comparison somewhat cloudy, but even when Occidental is excluded, the earnings for the remaining five firms increased 18%. For the six months, chemical earnings at the six oil companies were up 38% to $2.49 billion. Even without Occidental, earnings increased 30%.

Despite the modest overall earnings performance, individually most chemical company executives remain upbeat.

For Dow Chemical, the largest chemical company among the 30, financial vice president Enrique C. Falla says, "Overall volume continues strong, and, with the exception of polyethylene, prices remain stable. Margins at historic highs reflected the impact of flat prices and slightly increased costs versus previous quarters. Sales volume and supply/demand fundamentals remain strong globally."

"Outstanding" was the way Monsanto's chairman and chief executive officer Richard J. Mahoney characterized the company's second-quarter performance. Monsanto saw improvement in operating earnings in all of its units except NutraSweet.

Plastics were a problem at some companies. For instance, Robert D. Kennedy, Union Carbide's chairman, said that polyethylene prices have softened since the first quarter. But he noted that raw material

Ground rules for C&EN earnings analysis

C&EN's quarterly report on financial performance of the U.S. chemical industry contains data from the 30 largest U.S. basic chemical companies and from 24 oil and diversified companies, each with more than $200 million in annual chemical sales, plus 11 pharmaceutical companies.

To be included in the table of basic chemical producers, a company must have at least 50% of its sales in chemicals. That is why Du Pont, for example, is included in the table of diversified manufacturers.

In referring to chemical sales, C&EN means those chemicals whose molecular composition has been changed in the course of manufacture. Hence, chemical sales include those of traditional categories of basic petrochemicals and inorganics, organic intermediates and inorganic compounds, polymers such as plastics and fibers, and agricultural chemicals and specialty derivatives.

In listing earnings, the survey gives after-tax income for continuing operations before nonrecurring items and extraordinary charges. Foreign currency translations are included.

Earnings declines are spreading to oil, diversified, and drug firms

	SECOND-QUARTER 1989						FIRST-HALF 1989					
	Sales	Earnings[a]	Change from 1988		Profit margin[b]		Sales	Earnings[a]	Change from 1988		Profit margin[b]	
	($ millions)		Sales	Earnings	1989	1988	($ millions)		Sales	Earnings	1989	1988
OIL AND GAS COMPANIES												
American Petrofina	$ 847.4	$ 41.8	29%	22%	4.9%	5.2%	$ 1,566.3	$ 90.6	24%	40%	5.8%	5.1%
Amoco	6,078.0	497.0	13	−25	8.2	12.3	11,989.0	955.0	14	−16	8.0	10.8
Ashland	2,093.8	43.5	3	−24	2.1	2.8	3,993.8	38.5	2	−51	1.0	2.0
Chevron	8,200.0	392.0	12	14	4.8	4.7	15,900.0	705.0	7	−12	4.4	5.4
Exxon	23,611.0	1010.0	9	−16	4.3	5.5	45,855.0	2310.0	5	−13	5.0	6.1
Kerr-McGee	821.2	35.1	17	20	4.3	4.2	1,538.3	69.0	13	74	4.5	2.9
Mobil	14,003.0	541.0	0	4	3.9	3.7	28,023.0	970.0	1	−9	3.5	3.8
Occidental Petroleum	5,050.0	84.0	6	−3	1.7	1.8	10,193.0	150.0	11	3	1.5	1.6
Phillips Petroleum	3,299.0	197.0	15	16	6.0	5.9	6,401.0	387.0	11	29	6.0	5.2
Shell Oil	6,291.0	440.0	8	61	7.0	4.7	11,860.0	801.0	5	28	6.8	5.6
Sun Co.	2,920.0	105.0	20	9	3.6	4.0	5,560.0	186.0	15	19	3.3	3.2
Texaco	8,449.0	366.0	−9	−21	4.3	5.0	18,059.0	631.0	0	−14	3.5	4.1
Unocal	3,078.0	120.0	20	88	3.9	2.5	5,715.0	207.0	17	92	3.6	2.2
DIVERSIFIED MANUFACTURERS												
Allied-Signal	3,115.0	143.0	1	12	4.6	4.1	6,057.0	269.0	0	12	4.4	4.0
Du Pont	9,278.0	714.0	11	12	7.7	7.7	17,952.0	1450.0	11	18	8.1	7.6
Eastman Kodak	4,500.0	287.0	9	−26	6.4	9.4	8,400.0	487.0	13	−25	5.8	8.7
Engelhard	603.1	15.1	14	7	2.5	2.7	1,190.3	29.5	14	7	2.5	2.6
FMC	917.1	55.6	3	47	6.1	4.2	1,754.2	89.6	9	45	5.1	3.9
Ferro Corp.	275.5	13.2	6	11	4.8	4.6	546.9	25.5	9	11	4.7	4.6
3M	3,025.0	327.0	4	6	10.8	10.6	6,042.0	645.0	6	10	10.7	10.3
NL Industries	268.5	41.1	0	10	15.3	14.0	512.0	83.8	−2	24	16.4	12.9
PPG Industries	1,490.0	127.3	3	−5	8.5	9.2	2,950.0	257.1	5	2	8.7	9.0
Tyler	110.2	3.5	13	0	3.1	3.5	200.6	1.5	11	−61	0.8	2.2
Vulcan Materials	293.7	43.6	3	−5	14.8	16.2	511.2	59.2	5	−4	11.6	12.6
PHARMACEUTICAL COMPANIES												
American Home Products	1,400.7	236.4	2	10	16.9	15.7	2,920.6	500.5	5	11	17.1	16.3
Baxter Travenol	1,856.0	104.0	10	14	5.6	5.4	3,630.0	205.0	12	13	5.6	5.6
Becton Dickinson	442.8	39.0	1	−2	8.8	9.0	905.7	80.6	4	6	8.9	8.7
Bristol-Myers	1,534.5	212.5	5	12	13.8	13.1	3,136.7	449.6	5	12	14.3	13.5
Merck	1,585.2	396.6	6	25	25.0	21.1	3,156.6	737.0	7	25	23.3	20.0
Pfizer	1,302.7	135.7	−3	−36	10.4	15.9	2,739.0	376.5	4	−13	13.7	16.4
A. H. Robins	187.2	2.8	−2	−68	1.5	4.6	414.1	19.1	1	−18	4.6	5.7
Schering-Plough	805.5	120.5	7	19	15.0	13.4	1,637.3	246.2	9	22	15.0	13.5
SmithKline Beckman	1,255.5	118.6	10	20	9.4	8.7	2,497.3	248.8	9	−6	10.0	11.5
Upjohn	736.5	94.6	2	8	12.8	12.2	1,491.6	197.6	8	8	13.2	13.2
Warner Lambert	1,024.7	112.4	8	23	11.0	9.6	2,044.4	213.4	9	22	10.4	9.3

a After-tax earnings from continuing operations, excluding significant extraordinary and nonrecurring items. b After-tax earnings as a percentage of sales.

costs were still favorable. And Goodrich's Geon vinyl products segment reported operating income of $57.3 million in the second quarter, down from $62.1 million in the same period last year.

Aristech complained of continued compression of polypropylene margins. Despite improved volume, the company says, "soft pricing for the product, resulting from increased capacity and an unsettled export market, as well as increased raw material costs, had a significant comparative negative impact."

The export market affected many other companies as well. Rohm & Haas chairman J. Lawrence Wilson says "Second-quarter earnings were influenced strongly by external economic trends. Sales growth in the plastics and industrial chemicals business was affected adversely by slowing in segments of the U.S. and European economies; European and Pacific region earnings were hurt by the continuing weakening of the major European currencies and the Japanese yen; and margins were squeezed by higher raw material costs and inflation."

Cabot estimates that currency fluctuations reduced earnings by about

$11 million for the quarter. W. R. Grace notes a "severe currency devaluation in Argentina" as having a negative impact on its earnings.

Grace also notes that most factors that affected the second-quarter performance are not expected to continue over the remainder of the year.

It is this that makes the rest of the year so difficult to predict. If credit policy is eased, consumers may be more likely to reenter the housing market and to buy big-ticket items such as automobiles. Although some currency fluctuation may persist, it is hoped that the Latin American devaluations that have been harmful are over.

Companies are hoping that the outside influences that cut earnings growth to less than that of sales will be halted in the third and fourth quarters. Supporting this, Olin chairman John W. Johnstone Jr. remarks, "Given a stable economy, I believe Olin is in a good position to attain its 1989 objective of $6.00 per share in earnings." This, however, may include some economic slowing since the company earned $3.37 in the first half, leaving it with only $2.63 to achieve its goal.

Dow's Falla says that "even in light of a softened U.S. economy and a stronger dollar, Dow's overall business outlook remains bright. We are very pleased with the second-quarter results and we continue to be confident in our performance for the balance of the year."

Outside observers are not so sanguine, however. An economic forum convened by the Conference Board, the New York City-based business research organization, says that in the overall economy, the outlook for profits is cloudy. But for the chemical industry, the forum participants, 15 economic analysts in government, industry, and finance, say that the outlook is middling. They say that the upswing in chemical profits is coming to an end sooner than expected. The pricing environment has softened, and costs continue to creep up. Earnings could drop sharply, the forum says, if operating rates fall widely. "While this is likely only for a few products," the Board says, "unless export demand stays strong, the profits outlook is mediocre." □

Startup firm profits from sulfite bans

As the Food & Drug Administration (FDA) continues to limit or extend bans on sulfites used as food preservatives, one small company formed in February 1988 is offering alternatives based on proprietary blends of FDA-approved ingredients including citric acid, ascorbic acid, and sodium pyrophosphate.

Extended Product Life (EPL) president Scott Berger says the company's current focus is on providing a dry mix of ingredients that can be dissolved in water for application as a spray or dip to preserve fresh-cut apples, potatoes, and other fresh fruit and vegetables. The frozen, canned, and dehydrated food markets are even more promising, says Berger. The company estimates the total existing market for sulfite replacements is as large as $300 million annually.

EPL's sales for the fiscal year that ended April 1989 were about $32,000. Although it had a negative cash flow for the fiscal year, Berger says the company will break even next year with considerably higher sales.

Joe H. Cherry, who currently is the chairman of the botany and microbiology department at Auburn University, Auburn, Ala., says "other people's formulas depend on strong acids or heating. EPL's approach is to block enzymatic action and treat food as [living] tissue." Cherry developed EPL's patented formulas while at Purdue University.

Cherry holds a one-third interest in the company, which has its executive offices in Conshohocken, Pa., and which trades on the over-the-counter stock market.

The company's potential competitors include Monsanto, Pfizer, Hercules, and General Brands. EPL's Berger says his company's product should be viewed more as a "take-along" product that would enhance a packaging system's performance.

Marc Reisch

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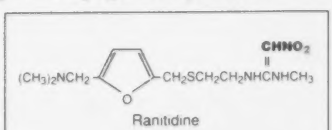

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